

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

IN RE APPLICATION

OF: **BESTE ET AL.**

SERIAL NO. 10/806,198

FILED: MARCH 23, 2004

FOR: PURIFICATION OR WORK-UP OF IONIC LIQUIDS BY MEANS OF ADSORPTIVE SEPARATION PROCESSES

DOCKET No.: PF++54391

CONFIRMATION No.: 2001

GROUP ART UNIT: 1723

EXAMINER: E. G. THERKORN

TO: HONORABLE COMMISSIONER FOR PATENTS
P.O. BOX 1450, ALEXANDRIA, VA 22313-1450

BRIEF ON APPEAL UNDER 37 C.F.R. §41.37

Sir:

1. ☐ NOTICE OF APPEAL: Applicant hereby appeals to the Board of Appeals from the decision dated -/-, of the Primary Examiner finally rejecting Claims -/-.
2. ☒ BRIEF ON APPEAL in this application is transmitted herewith.
☐ Applicants hereby request an Oral Hearing.
3. ☒ Applicants hereby request entry of their timely reply dated October 22, 2007, for purposes of appeal.
4. ☐ Applicants hereby petition for a -/- month extension of time under 37 C.F.R. §1.136(a).
☐ A petition for a -/- month extension of time including the requisite fee of -/- has been submitted along with the reply under 37 C.F.R. §1.116 dated -/-.
5. ☒ The following fee(s) in the total amount of \$ 510.00 is(are) paid herewith by credit card:
☒ The \$ 510.00 fee required under 37 C.F.R. §41.20(b)(2).
☐ The -/- fee required under 37 C.F.R. §41.20(b)(3).
☐ The -/- fee required under 37 C.F.R. §1.17(a).
6. ☒ The Commissioner is hereby authorized to charge any fee which may be further required, including Extension of Time fees, and to credit any over payment, to Deposit Account No. 14.1437. A duplicate copy of this sheet is attached.

Respectfully submitted,
NOVAK DRUCE DELUCA + QUIGG

/James Remenick/ James Remenick
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TO: HONORABLE COMMISSIONER FOR PATENTS
 P.O. BOX 1450, ALEXANDRIA, VA 22313-1450

BRIEF ON APPEAL UNDER 37 C.F.R. §41.37

Sir:

This is an appeal from the Examiner's final rejection of Claims 1 to 4, 6 to 13, 17, 18, and 20 to 24 dated August 01, 2007. Claims 1 to 4, 6 to 13, 17, 18, and 20 to 24 are currently pending.

Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees, to Deposit Account No. 14.1437. Please credit any excess fees to such deposit account.

Respectfully submitted,
NOVAK DRUCE DELUCA & QUIGG

/James Remenick/ James Remenick
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JR/BAS

REAL PARTY IN INTEREST

To the best of the undersigned's knowledge, the real party in interest is BASF Aktiengesellschaft, 67056 Ludwigshafen, Germany.

RELATED APPEALS AND INTERFERENCES

To the best of the undersigned's knowledge, there are no related appeals or interferences within the meaning of 37 C.F.R. §41.37(c)(1)(ii).

STATUS OF THE CLAIMS

Claims 1 to 4, 6 to 13, 17, 18, and 20 to 24 are currently pending. A copy of these claims is found in the attached Claims Appendix. More specifically, the status of the claims is as follows:

- Claim(s) 1 to 4, 6 to 13, 17, 18, and 20 to 24 is(are) pending;
- Claim(s) 1 to 4, 6 to 13, 17, 18, and 20 to 24 is(are) rejected, and is(are) being appealed;
- Claim(s) -- is(are) allowed;
- Claim(s) -- is(are) withdrawn;
- Claim(s) -- is(are) objected to; and
- Claim(s) 5, 14 to 16, and 19 is(are) canceled.

STATUS OF THE AMENDMENTS

The claims as currently pending were presented on June 22, 2007, with appellants' reply to the non-final Office action mailed on March 22, 2007. No amendments were filed subsequent to final action.

SUMMARY OF THE CLAIMED SUBJECT MATTER

Claims 1, 4, 8 and 18 are independent claims and/or will be argued separately in this paper. Claims 2, 3, 6, 7, 9-13, 17 and 20-24 depend upon Claim 1, 8 or 18, and will not be argued separately. A summary of the respective embodiments of appellants' invention is therefore not deemed to be necessary.¹⁾

1) 37 C.F.R. §41.37(v).

Each of appellants' claims pertains to a particular process for purifying an ionic liquid (IL) which is contaminated with at least one impurity, wherein the at least one impurity is

- a substance having a vapor pressure in the mixture with the ionic liquid that prohibits complete removal of the substance from the mixture by distillation, and/or
- a substance that interacts with the at least one ionic liquid so as to prohibit complete removal of the substance from the mixture by distillation,

and wherein the at least one impurity is removed from the contaminated ionic liquid by way of adsorptive separation.²⁾

In accordance with the embodiment of appellants' process which is defined in Claim 4, the adsorptive separation is a continuous chromatographic process.³⁾

Claim 8 requires that the ionic liquid have an anion and cation,⁴⁾ that the cation comprise at least one five- or six-membered heterocycle containing at least one phosphorus or nitrogen atom,⁵⁾ and that the contaminated ionic liquid be contacted with a resin, and the purified ionic liquid be separated from the resin.⁶⁾

The embodiment of appellants' process which is defined in Claim 18 entails providing the ionic liquid by

- (a) separating volatile components from a mixture comprising the ionic liquid, the volatile components and the at least one impurity, by means of evaporation or rectification,⁷⁾ and/or
- (b) separating non-polar components from a mixture comprising the ionic liquid, the non-polar components and the at least one impurity, by means of extraction with a non-polar organic solvent.⁸⁾

Appellants found that an economical purification of contaminated ionic liquids by vaporization (i.e., distillation) is not possible where the contaminating impurity is a high-boiling compo-

2) Claims 1, 4, 8 and 18. Cf., e.g., page 12, indicated lines 1 to 8, and page 16, indicated lines 3 to 5, in conjunction with page 11, indicated lines 4 to 6, 14 to 21 and 31 to 35, of the application.

3) E.g., page 12, indicated lines 15 to 18, in conjunction with page 12, indicated line 20, to page 13, indicated line 12, of the application.

4) E.g., page 1, indicated lines 26, to 28, of the application.

5) E.g., page 1, indicated lines 34 to 37, of the application,

6) E.g., page 12, indicated lines 22 to 39, page 13, indicated lines 14 to 40, and page 14, indicated line 36, to page 15, indicated line 13, of the application.

7) E.g., page 11, indicated lines 10 to 12, in conjunction with page 14, indicated lines 21 and 22, of the application.

8) E.g., page 11, indicated lines 28 to 31, of the application.

ment, i.e., a polymer which has no measurable vapor pressure or a substance which has only a low vapor pressure of less than about 10 mbar at room temperature, or the impurity is a substance which has a particularly strong interaction with the ionic liquid and can, therefore, not be removed completely from the ionic liquid by way of a distillation.⁹⁾ Appellants' process remedies these disadvantages and makes it possible to achieve an economical separation which is simple in process engineering terms.¹⁰⁾ In particular, appellants' process is useful for separating off high-boiling components which frequently impart a color and/or impair the properties of the ionic liquid and/or have other adverse effects.¹¹⁾ Since the purified ionic liquid which is obtained in appellants' process can be re-used, appellants' process improves the economy of industrial applications in which ionic liquids are employed.¹²⁾

GROUND(S) OF REJECTION TO BE REVIEWED

- 1) Whether the Examiner erred finding that appellants' Claims 18 and 20 were unpatentable under 35 U.S.C. §112, ¶1, for failing to comply with the written description requirement.¹³⁾
- 2) Whether the Examiner erred finding that appellants' Claims 1-4, 6-13, 17, 18, and 20-24 were unpatentable under 35 U.S.C. §112, ¶2, for being indefinite.¹⁴⁾
- 3) Whether the Examiner erred finding that appellants' Claims 1-3, 8-11, 13, 17, 18, and 20-24 were unpatentable under 35 U.S.C. §102(b) for being anticipated by or, in the alternative, under 35 U.S.C. §103(a) for being obvious in light of *Earle et al.* (US 2004/0015009).¹⁵⁾
- 4) Whether the Examiner erred finding that appellants' Claims 1-3, 8-11, 13, 17, 18, and 20-24 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of *Earle et al.* (*ibid.*) alone or taken in view of *Hackh's Chemical Dictionary*¹⁶⁾ and either *Kawaki et al.* (US 5,543,474) or *Thiem et al.* (US 4,751,291).¹⁷⁾
- 5) Whether the Examiner erred finding that appellants' Claims 2, 6, 7, 9, 12, 18, and 20-24 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of *Earle et al.* (*ibid.*)

9) E.g., page 11, indicated lines 14 to 21, and 31 to 35, of the application.

10) E.g., page 12, indicated lines 1 to 8, of the application.

11) E.g., page 14, indicated lines 8 to 11, of the application.

12) E.g., page 10, indicated line 30, to page 11, indicated line 8, of the application.

13) Cf. final Office action page 2, lines 1 to 7.

14) Cf. final Office action page 2, lines 8 to 21.

15) Cf. final Office action page 3, lines 19 to 26.

16) McGraw-Hill Book, New York, 1972, page 461.

17) Cf. final Office action page 4, lines 1 to 17.

- alone or taken in view of *Hackh's* Chemical Dictionary¹⁶⁾ and either *Kawaki et al.* (*ibid.*) or *Thiem et al.* (*ibid.*), and further in view of *Snyder*.^{18),19)}
- 6) Whether the Examiner erred finding that appellants' Claims 18 and 20 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of *Earle et al.* (*ibid.*) alone or taken in view of *Hackh's* Chemical Dictionary,¹⁶⁾ either *Kawaki et al.* (*ibid.*) or *Thiem et al.* (*ibid.*), and *Snyder*,¹⁸⁾ and further in view of *Mikes et al.*^{20),21)}
 - 7) Whether the Examiner erred finding that appellants' Claim 4 was unpatentable under 35 U.S.C. §103(a) for being obvious in light of *Earle et al.* (*ibid.*) alone or taken in view of *Hackh's* Chemical Dictionary¹⁶⁾ and either *Kawaki et al.* (*ibid.*) or *Thiem et al.* (*ibid.*), and further in view of *Gerhold* (US 4,402,832).²²⁾
 - 8) Whether the Examiner erred finding that appellants' Claims 11, 18, and 20 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of *Earle et al.* (*ibid.*) alone or taken in view of *Hackh's* Chemical Dictionary¹⁶⁾ and either *Kawaki et al.* (*ibid.*) or *Thiem et al.* (*ibid.*), and further in view of *Wasserscheid et al.*^{23),24)}
 - 9) Whether the Examiner erred finding that appellants' Claims 18 and 20 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of *Earle et al.* (*ibid.*) alone or taken in view of *Hackh's* Chemical Dictionary¹⁶⁾ and either *Kawaki et al.* (*ibid.*) or *Thiem et al.* (*ibid.*), and *Wasserscheid et al.*,²³⁾ and further in view of *Snyder*¹⁸⁾ and *Mikes et al.*^{20),25)}
 - 10) Whether the Examiner erred finding that appellants' Claims 1-3, 8-11, 13, 17, 18, and 20-24 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants' alleged admissions on page 10, line 39 through page 11, line 39 of the specification in view of *Earle et al.* (*ibid.*).²⁶⁾
 - 11) Whether the Examiner erred finding that appellants' Claims 2, 6, 7, 9, 12, 18, and 20-24 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants' alleged

18) Introduction to Modern Liquid Chromatography, John Wiley & Sons New York, 1979, pages 270-272, 285, and 410-411.

19) Cf. final Office action page 4, line 18, to page 5, line 17, and page 7, line 15, to page 8, line 14.

20) Laboratory Handbook of Chromatographic and Allied Methods, John Wiley & Sons New York, 1979, pages 218-219.

21) Cf. final Office action page 5, line 18, to page 6, line 18.

22) Cf. final Office action page 6, line 19, to page 7, line 14.

23) Ionic Liquids in Synthesis, Wiley-Vch Verlag, Weinheim, 2003.

24) Cf. final Office action page 8, line 15, to page 9, line 9.

25) Cf. final Office action page 9, line 10, to page 10, line 16.

26) Cf. final Office action page 10, line 17, to page 11, line 9.

admissions in view of *Earle et al.* (*ibid.*), and further in view of *Snyder*.^{18),27)}

- 12) Whether the Examiner erred finding that appellants' Claims 18 and 20 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants' alleged admissions in view of *Earle et al.* (*ibid.*) and *Snyder*,¹⁸⁾ and further in view of *Mikes et al.*^{20),28)}
- 13) Whether the Examiner erred finding that appellants' Claim 4 was unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants' alleged admissions in view of *Earle et al.* (*ibid.*), and further in view of *Gerhold* (*ibid.*).²⁹⁾
- 14) Whether the Examiner erred finding that appellants' Claims 11, 18, and 20 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants' alleged admissions in view of *Earle et al.* (*ibid.*), and further in view of *Wasserscheid et al.*^{23),30)}
- 15) Whether the Examiner erred finding that appellants' Claims 18 and 20 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants' alleged admissions in view of *Earle et al.* (*ibid.*) and *Wasserscheid et al.*,²³⁾ and further in view of *Snyder*¹⁸⁾ and *Mikes et al.*^{20),31)}

ARGUMENT(S)

1) The Examiner's finding that appellants' Claims 18 and 20 were unpatentable under 35 U.S.C. §112, ¶1, for failing to comply with the written description requirement¹³⁾ is, for the following reasons, deemed to be in error.

The Examiner asserted that the provisions of Claim 18:

providing the contaminated ionic liquid by

- (a) *separating volatile components from a mixture comprising the ionic liquid, the volatile components and the at least one impurity, by means of evaporation or rectification, and/or*
- (b) *separating non-polar components from a mixture comprising the ionic liquid, the non-polar components and the at least one impurity, by means of extraction with a non-polar organic solvent,*

lacked adequate support in the application and that the provisions therefore introduced new matter.

27) Cf. final Office action page 11, line 10, to page 12, line 5, and page 13, line 18, to page 14, line 14.

28) Cf. final Office action page 12, line 6, to page 13, line 3.

29) Cf. final Office action page 13, lines 4 to 17.

30) Cf. final Office action page 14, line 15, to page 15, line 6.

31) Cf. final Office action page 15, line 7, to page 16, line 10.

According to Section 112, ¶1, a patent specification must contain a written description of the invention which is sufficient to allow a person of ordinary skill in the art to recognize that the inventor(s) invented what is claimed,³²⁾ and the new matter doctrine prevents an applicant from adding new subject matter to the claims unless the specification shows that the inventor(s) had support for the addition at the time of the original filing.³³⁾ There is no *heac verba* requirement for matter which is added to a claim, however, the newly added claim limitations must be supported in the specification through express, implicit, or inherent disclosure.³⁴⁾ Appellants respectfully urge that the provisions in question are supported in appellants' specification through express or inherent disclosure, and that the application as filed, therefore, shows that appellants had possession of the invention at the time of the original filing.

Appellants point out:³⁵⁾ *"It is an object of the present invention to find an alternative process for the purification of mixtures comprising ionic liquids, which remedies the above-mentioned disadvantages and makes it possible to achieve an economical separation which is simple in process engineering terms. We have found that this objective is achieved by ..."* Additionally, appellants describe that the separation of volatile components by way of evaporation or rectification,³⁶⁾ and the separation of non-polar high boilers,³⁷⁾ does not pose a problem. The respective sections of appellants' disclosure, as such, clearly convey that the process particularly seeks to remove such impurities which remain in a contaminated ionic liquid after other economical purification methods have been applied. Appellants' disclosure further clarifies that the process is particularly useful for separating off high-boiling components,³⁸⁾ i.e., substances which cannot be removed completely from the ionic liquid by vaporization,³⁹⁾ and interfering impurities which cannot be washed out of the ionic liquid by way of extraction.⁴⁰⁾ Moreover, Example 1 of the application sets forth:⁴¹⁾ *"All volatile components could be removed by evaporation on a rotary evaporator. This barely changed the color. It became more concentrated. XRF analysis of the contaminated IL indicated relatively large amounts of S. In addition, Al, Cr, Mg, Fe, Ni, Cu were detected (< 1000 ppm). In the shaking*

32) *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473 (Fed. Cir. 1998); *In re Gosteli*, 872 F.2d 1008 (Fed. Cir. 1989).

33) *Kilmes v. World Fibers Corp.*, 107 F.3d 1534, 1539 (Fed. Cir. 1997).

34) MPEP §2163 I.B.

35) Page 12, indicated lines 1 to 6, of the application; emphasis added.

36) Page 11, indicated lines 10 to 12, of the application.

37) Page 11, indicated lines 28 to 30, of the application.

38) Page 14, indicated lines 8 to 11, of the application.

39) Page 11, indicated lines 15 to 21, of the application.

40) Page 11, indicated lines 28 to 32, of the application.

41) Page 14, indicated lines 21 to 27, of the application.

experiment, 25 ml of this contaminated IL were in each case brought into contact with one of a variety of adsorbents for 24 hours. The liquid was then filtered.” As such, Example 1 in conjunction with the explanations given in the description of the invention provides an express disclosure of the manner of providing a contaminated ionic liquid which is set forth in provision (a) of Claim 18. Provision (b) of Claim 18 is at least implicitly disclosed through Example 1 and the comparative example⁴²⁾ when taken in conjunction with the explanations given in the description of the invention. Example 1 and the comparative example illustrate that the interfering impurities remained in the contaminated ionic liquid after extraction of the liquid with a non-polar solvent, but could be removed when the contaminated ionic liquid was subjected to an adsorptive separation.

The Examiner’s position that the provisions (a) and (b) of Claim 18 introduced new matter is therefore deemed to be in error.

2) The Examiner’s finding that appellants’ Claims 1–4, 6–13, 17, 18, and 20–24 were unpatentable under 35 U.S.C. §112, ¶2, for being indefinite¹⁴⁾ is, for the following reasons, deemed to be in error.

The purpose of the claim is not to explain the technology or how it works, but to state the legal boundaries of the patent grant, i.e., a claim is not “indefinite” simply because it is hard to understand without benefit of the specification,⁴³⁾ or the knowledge of a person of ordinary skill in the pertinent art. The test of definiteness is, accordingly, whether a person of ordinary skill in the art would understand the bounds of the claim when reading it in the light of the supporting specification,⁴⁴⁾ and claims may use language that those skilled in the art understand without the need for explicit, detailed definitions in the written description.⁴⁵⁾ It is not necessary to define an invention with mathematical precision in order to comply with the definiteness requirement⁴⁶⁾ as claims need only *reasonably apprise those skilled in the art* as to their scope and be as precise as

42) Page 15, indicated lines 15 to 22, of the application.

43) *S3 Inc. v. nVIDIA Corp.*, 259 F.3d 1364, 59 USPQ2d 1745 (Fed. Cir. 2001); cf. also *Autogiro Co. of America v. United States*, 384 F.2d 391, 397, 155 USPQ 697, 701 (Ct. Cl. 1967) (a claim cannot be interpreted without going beyond the claim itself).

44) Cf. *Morton Int. Inc. v. Cardinal Chem. Co.*, 5 F.3d 1464, 28 USPQ2d 1190 (Fed. Cir. 1993); *Orthokinetics Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1 USPQ2d 1081 (Fed. Cir. 1986).

45) *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1556–1558, 220 USPQ 303, 315–16 (Fed. Cir. 1983).

46) *In re Marosi*, 710 F.2d 799, 802–03, 218 USPQ 292 (Fed. Cir. 1983); see also *Modine Mfg Co. v. U.S. Int’l Trade Comm’n*, 75 F.3d 1545, 1557, 37 USPQ2d 1609, 1617 (Fed. Cir. 1996), *cert. denied*, 518 U.S. 1005 (1996).

the subject matter permits.⁴⁷⁾ In particular, it is not required to claim each part of an invention with the same amount of detail; indeed, the Court of Appeals has acknowledged that such a rule likely would prove unworkable.⁴⁸⁾

The Examiner argued that:⁴⁹⁾ *“The metes and bounds of ‘a substance having a vapor pressure in the mixture that prohibits complete removal of the substance from the mixture by distillation’ and ‘a substance that interacts with the at least one ionic liquid so as to prohibit complete removal of the substance from the mixture by distillation’ can not be determined.”* However, in reviewing a claim for compliance with the provisions of Section 112, ¶2, the examiner must consider the claim as a whole to determine whether the claim, when viewed in light of the supporting disclosure, apprises one of ordinary skill in the art of its scope. It is deemed to be immediately apparent to a person having ordinary skill in the art, in particular in light of appellants’ representative examples, that appellants’ invention provides for a purification of a contaminated ionic liquid from impurities where the impurity cannot be separated from the ionic liquid via a distillation due to technical or economical constraints.⁵⁰⁾

The Examiner also took the position:⁵¹⁾ *“what can and can not be distilled would appear to be a function of the skill of the distiller and would change over time.”* Appellants respectfully disagree. The question whether a substance can or cannot be distilled cannot reasonably be deemed to be a function of the skill of the distiller and/or time. Numerous substances cannot be distilled, e.g., a broad variety of polymeric and inorganic substances, and numerous mixtures cannot be separated by distillation, e.g., azeotropes. The Examiner’s respective argument is, therefore, not deemed to be technically sound.

The Examiner further argued that:⁵²⁾ *“Claim 24’s ‘no measurable vapor pressure’ is considered to be indefinite because what can and can not be measured would appear to be a function of the skill of the measurer, his tools, and would change over time”* is, for the same reasons, deemed to be without merits because it is based on the erroneous assumption that all substances have a vapor pressure at room temperature in mixture with an ionic liquid.

In rejecting a claim under the second paragraph of 35 U.S.C. 112, it is incumbent on the

47) *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 USPQ 634 (Fed. Cir. 1985), cert. denied, 480 U.S. 947 (1987).

48) *Resonate Inc. v. Alteon Websystems, Inc.*, 338 F.3d 1360, 67 USPQ2d 1771 (Fed. Cir. 2003).

49) Cf. final Office action page 2, lines 10 to 14.

50) Cf. also appellants’ explanations on page 11, indicated lines 1 to 8, and on page 11, indicated line 14, to page 12, indicated line 8, of the application.

51) Cf. final Office action page 2, lines 16 to 18, and page 16, line 22, to page 17, line 4.

52) Cf. final Office action page 2, lines 19 to 21.

*examiner to establish that one of ordinary skill in the pertinent art, when reading the claims in light of the supporting specification, would not have been able to ascertain with reasonable degree of precision and particularity the particular area set out and circumscribed by the claims.*⁵³⁾

The Examiner's arguments cannot be deemed to establish that a person of ordinary skill in the pertinent art would not have been able to ascertain the metes and bounds of appellants' claims with a *reasonable* degree of precision and particularity, and the Examiner's position that appellants' Claims 1-4, 6-13, 17, 18, and 20-24 were indefinite is therefore deemed to be in error.

3) The Examiner's finding that appellants' Claims 1-3, 8-11, 13, 17, 18, and 20-24 were unpatentable under 35 U.S.C. §102(b) for being anticipated by or, in the alternative, under 35 U.S.C. §103(a) for being obvious in light of Earle et al.¹⁵⁾ is, for the following reasons, deemed to be in error.

Anticipation under Section 102 can be found only if a reference shows *exactly* what is claimed, i.e., all material elements of the invention as claimed must be found in one prior art source,⁵⁴⁾ the elements must be shown in the reference in as much detail as is contained in the claim,⁵⁵⁾ and the elements must be shown in the reference in the part-to-part relationship which is set forth in the claim.⁵⁶⁾ The disclosure of the elements may be express, implicit or inherent.⁵⁷⁾ However, the fact that a certain result or characteristic *may* occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.⁵⁸⁾

The teaching of *Earle et al.* cannot be deemed to provide a description of the subject matter defined in appellants' claims which meets these standards which were developed by the Courts for anticipation under Section 102.

Appellants' claims relate to a process for the purification of ionic liquids which are contaminated by at least one impurity, and appellants' process comprises removing the at least one impurity from the contaminated ionic liquids by way of an adsorptive separation.

53) *Ex parte Wu*, 10 USPQ2d 2031 at 2033 (Bd. Pat. App. & Inter. 1989).

54) Cf. *In re Marshall*, 577 F.2d 301, 198 USPQ 344 (CCPA 1978); *In re Kalm*, 378 F.2d 959, 154 USPQ 10 (CCPA 1967).

55) Cf. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1913 (Fed. Cir. 1989).

56) Cf. *Lindemann Maschinenfabrik v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481 (Fed. Cir. 1984).

57) *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995). See also *In re Grasselli*, 713 F.2d 731, 739, 218 USPQ 769, 775 (Fed. Cir. 1983).

58) *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993); *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981).

Earle et al. address a process for the oxidation of alkyl-aromatic compounds which is conducted in the presence of an ionic liquid and an acid promoter as catalyst. The reference mentions, on the one hand, methods for separating the oxidation product and the ionic liquid,⁵⁹⁾ and on the other hand, methods for separating the product and the ionic liquid/acid promoter combination.⁶⁰⁾ Additionally, the reference provides that the ionic liquid/acid promoter combination may be re-oxidized and recycled for use in further reactions.⁶¹⁾

Neither the statements regarding the separation of the product and the ionic liquid, nor the statements regarding the separation of the product and the ionic liquid/acid promoter combination, are deemed to pertain to the separation of an ionic liquid and at least one impurity.

It is for the purposes of *Earle et al.*'s process clearly without consequence whether the ionic liquid/acidic promoter fraction which is recycled after the respective separation comprises residual product. In fact, when the ionic liquid or the ionic liquid/acid promoter combination is recycled as discussed in the reference, any residual amounts of the product, or for that matter any starting materials which may be present, are made available again. Also, neither the product, nor any starting material or acid promoter, can be deemed to impede the oxidation process of *Earle et al.* As such, neither the product, nor any starting materials or acid promoter, can reasonably be deemed to accumulate in the ionic liquid so as to render the ionic liquid unsuitable for recycling. Accordingly, any such materials cannot be regarded as impurities. As noted in appellants' disclosure, impurities are substances which accumulate in recycled streams of ionic liquids,⁶²⁾ and which frequently impart color and/or impair the properties of the ionic liquid and/or have other adverse effects.⁶³⁾ The sections of the teaching of *Earle et al.* which enumerate means for the separation of the product and the ionic liquid, or for the separation of the product and the ionic liquid/acid promoter combination, can therefore not be deemed to identically describe the purification of an ionic liquid which is contaminated with at least one impurity which is claimed by appellants.

The only substances mentioned by *Earle et al.* which may appear to correspond to the "impurities" referenced in appellants' claims are the by-products which are mentioned in the description of the illustrative examples of the reference.⁶⁴⁾ However, these by-products are, according to the reference, removed by way of a distillation. The illustrative examples of *Earle et al.* can, therefore, also not be deemed to identically describe appellants' process.

59) Cf. page 1, para. [0008], of *US 2004/0015009*.

60) Cf. page 3, para. [0043], of *US 2004/0015009*.

61) Cf. page 3, para. [0042], of *US 2004/0015009*.

62) Page 11, indicated lines 4 and 5, of the application.

63) Page 14, indicated lines 10 and 11, of the application.

64) Cf. page 2, para. [0023], to page 3, para. [0037], of *US 2004/0015009*.

The separation procedures which are generally mentioned or specifically illustrated in the reference clearly fail to identically describe, explicitly or inherently, a process in which at least one impurity is removed from a contaminated ionic liquid by way of adsorptive separation. The Examiner's position that the teaching of *Earle et al.* anticipates the subject matter of appellants' claims within the meaning of Section 102 is therefore deemed to be in error.

The teaching of *Earle et al.* is also not deemed to be sufficient to render appellants' purification process *prima facie* obvious within the meaning of Section 103(a). “Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.”⁶⁵⁾ While noting that the analysis under 35 U.S.C. §103 “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ,”⁶⁶⁾ the Supreme Court cautioned, however, that “rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”⁶⁷⁾ The Supreme Court also emphasized the need “to determine whether there was an apparent reason to combine known elements in the fashion claimed by the patent at issue.”⁶⁸⁾ To establish a *prima facie* case of obviousness it is, therefore, essential that there be some motivation or suggestion to make the claimed invention in light of the prior art teachings.⁶⁹⁾ “[A] proper analysis under §103 requires, *inter alia*, consideration of ... whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed pro-

65) *Graham v. John Deere*, 383 U.S. 1, at 17 – 18, 148 USPQ 459 (1966). Cf. *KSR Int’l v. Teleflex, Inc.*, 550 U.S. ____ (2007), Slip op. at 2.

66) *KSR Int’l v. Teleflex Inc.*, 127 S.Ct. 1727, ___, 82 USPQ2d 1385, 1397 (2007).

67) *KSR Int’l v. Teleflex, Inc.*, 127 S.Ct. at ___, 82 USPQ2d at 1396 (quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)).

68) *KSR Int’l v. Teleflex, Inc.*, 550 U.S. ____ (2007), Slip op. at 14.

69) See, e.g., *In re Brouwer*, 77 F.3d 422, 425, 37 USPQ2d 1663, 1666 (Fed. Cir. 1996) (“[T]he mere possibility that one of the esters or the active methylene group-containing compounds . . . could be modified or replaced such that its use would lead to the specific sulfoalkylated resin recited in claim 8 does not make the process recited in claim 8 obvious “unless the prior art suggested the desirability of [such a] modification” or replacement.”) (quoting *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984)).

cess.”⁷⁰⁾

The Examiner took the position:⁷¹⁾ “if a difference exists between the claims and Earle (...), it would reside in optimizing the elements of Earle (...). It would have been obvious to optimize the elements of Earle (...) to enhance separation.”

However, a particular parameter must first be recognized as a result effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.⁷²⁾ The ability to arrive at claimed subject matter through experimentation does not render a claim obvious when the experimentation and result are not suggested by the teachings in the art.⁷³⁾

As noted above, the information which is provided in the reference and upon which the Examiner relies concerns the separation of the product and the ionic liquid, or the product and the ionic liquid/acid promoter combination. The product does not qualify as an impurity, and an optimization to enhance the respective separations can, therefore, not yield in appellants’ process. Additionally, the by-products which are mentioned by *Earle et al.* can also not be deemed to qualify as impurities, i.e., a substance which accumulates in the ionic liquid. In accordance with the teaching of *Earle et al.*, the by-products are removed by distillation at 100°C and 5 mmHg, and the products were distilled off at 150°C and 5 mmHg. The by-products of *Earle et al.*’s process, therefore, cannot accumulate in the recycled streams of the ionic liquid, or recycled streams of the ionic liquid/promoter combination. An optimization of the respective separation is also superfluous.

The Examiner’s position that the subject matter of appellants’ claims was rendered *prima facie* obvious by the teaching of *Earle et al.* is therefore deemed to be in error.

4) The Examiner’s finding that appellants’ Claims 1-3, 8-11, 13, 17, 18, and 20-24 where unpatentable under 35 U.S.C. §103(a) for being obvious in light of Earle et al. alone or taken in view of Hackh’s Chemical Dictionary and either Kawaki et al. or Thiem et al.¹⁷⁾ is, for the following reasons, deemed to be in error.

The Examiner applied *Hackh*’s Chemical Dictionary, and the disclosures of *Kawaki et al.* and of *Thiem et al.*, to show that the nitrotoluene by-products which are mentioned in the illustrative examples of *Earle et al.* are high boiling as well as polar.

70) *In re Vaeck*, 947 F.2d 488, 493, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991).

71) Cf. final Office action page 3, lines 22 to 26.

72) *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977).

73) *In re Waymouth*, 499 F.2d 1273, 182 USPQ 290 (CCPA 1974).

However, *Earle et al.* illustrate that the respective by-products are removed by way of distillation. As such, the by-products cannot be deemed to fall within the realm of substances

- which have a vapor pressure in the mixture that prohibits complete removal of the substance from the mixture by distillation, and/or
- which interact with the at least one ionic liquid so as to prohibit complete removal of the substance from the mixture by distillation,

i.e., the impurities which are specified in appellants' claims.

Accordingly, the teaching of *Earle et al.* when taken in view of *Hackh's* Chemical Dictionary and/or the disclosure of *Kawaki et al.* and/or the disclosure of *Thiem et al.* can also not be deemed to render appellants' process obvious within the meaning of Section 103(a), and the Examiner's respective position is deemed to be in error.

5) The Examiner's finding that appellants' Claims 2, 6, 7, 9, 12, 18, and 20-24 where unpatentable under 35 U.S.C. §103(a) for being obvious in light of Earle et al. alone or taken in view of Hackh's Chemical Dictionary and either Kawaki et al. or Thiem et al., and further in view of Snyder¹⁹⁾ is, for the following reasons, deemed to be in error.

The Examiner applied the disclosure of *Snyder* for stating that ion exchange was the first of various liquid chromatography methods to be used widely under modern conditions, and for disclosing that reversed phase silica gel packings are the closest to a universal system for modern liquid chromatography and that water is usually used as a base solvent,⁷⁴⁾ arguing that a person of ordinary skill in the art would therefore have been motivated to employ ion exchange, with water as a solvent, and reverse phase silica gel in the separation conducted in the procedure of *Earle et al.*⁷⁵⁾ However, the modification of the prior art process proposed by the Examiner does not yield in, or point in the direction of, appellants' process.

The nitrotoluene by-products of *Earle et al.*'s process distill off at a considerably lower temperature than the product, i.e., the by-products cannot accumulate in the ionic liquid, and the nitrotoluenes therefore cannot be considered to correspond to the impurities defined in appellants' claims. The teaching of *Earle et al.* clearly fails to suggest or imply a contamination of the ionic liquid or the ionic liquid/promoter combination with impurities, and neither the disclosure of *Hackh's* Chemical Dictionary, of *Kawaki et al.* and of *Thiem et al.* nor the disclosure of *Snyder* is suitable to bridge the gap between appellants' invention and the teaching of *Earle et al.*

74) Cf. final Office action page 5, lines 6 to 9, and page 8, lines 3 to 7.

75) Cf. final Office action page 5, lines 9 to 10, and page 8, lines 7 to 14.

The Examiner's position that the subject matter of appellants' claims was *prima facie* obvious in light of the teaching of *Earle et al.* when taken in view of the respective secondary references is therefore deemed to be in error.

6) The Examiner's finding that appellants' Claims 18 and 20 where unpatentable under 35 U.S.C. §103(a) for being obvious in light of Earle et al. alone or taken in view of Hackh's Chemical Dictionary, either Kawaki et al. or Thiem et al., and Snyder, and further in view of Mikes et al.²¹⁾ is, for the following reasons, deemed to be in error.

The Examiner alleged:⁷⁶⁾ "At best, the claims differ from Earle (...) alone or further in view of Hackh's Chemical Dictionary, ..., either Kawaki (...) or Thiem (...), and Snyder, ... in the clarity of reciting a resin," and argued:⁷⁷⁾ "It would have been obvious that Earle (...) alone or further in view of Hackh's Chemical Dictionary, ..., either Kawaki (...) or Thiem (...), and Snyder, ... uses a resin because Mikes' [sic] Laboratory Handbook ... discloses that synthetic resins are of the greatest importance for ion exchange chromatography."

Notably, appellants' Claim 18 does not refer to a resin, but requires, *inter alia*, that the contaminated ionic liquid be provided by

- (a) separating volatile components from a mixture comprising the ionic liquid, the volatile components and the at least one impurity, by means of evaporation or rectification, and/or
- (b) separating non-polar components from a mixture comprising the ionic liquid, the non-polar components and the at least one impurity, by means of extraction with a non-polar organic solvent.

Neither the teaching of *Earle et al.* nor the secondary references suggest or imply the respective provisions. Moreover, the Examiner failed to acknowledge this difference between the prior art and appellants' claims. However, when evaluating claims for obviousness under 35 U.S.C. §103, all the limitations of the claims must be considered and given weight, including limitations which do not find support in the specification as originally filed (i.e., new matter).⁷⁸⁾

Furthermore, as noted in the foregoing, the product obtained in *Earle et al.*'s process cannot be deemed to constitute an impurity because it cannot reasonably be expected to accumulate in the ionic liquid, and/or to impede the oxidation reaction. The by-products which are formed in the context of the oxidation reaction of *Earle et al.* are removed by distillation and can, as such, also not be deemed to constitute impurities.

76) Cf. final Office action page 6, lines 3 to 8.

77) Cf. final Office action page 6, lines 11 to 18.

78) *Ex parte Grasselli*, 231 USPQ 393 (Bd. App. 1983) aff'd mem. 738 F.2d 453 (Fed. Cir. 1984).

The Examiner's position that the combination of references is suited to render the subject matter of appellants' Claims 18 and 20 *prima facie* obvious within the meaning of Section 103(a) is, at least for the foregoing reasons, deemed to be in error.

7) The Examiner's finding that appellants' Claim 4 was unpatentable under 35 U.S.C. §103(a) for being obvious in light of Earle et al. alone or taken in view of Hackh's Chemical Dictionary and either Kawaki et al. or Thiem et al., and further in view of Gerhold²²⁾ is, for the following reasons, deemed to be in error.

The Examiner applied the disclosure of *Gerhold* for stating that a simulated moving bed is a very successful process for separating components from a feed mixture, and asserted that a person of ordinary skill in the art would therefore have been motivated to employ a continuous chromatographic process as required in accordance with appellants' Claim 4 for the separations mentioned in the teaching of *Earle et al.*⁷⁹⁾

However, the respective modification of *Earle et al.*'s process cannot be deemed to result in appellants' process or even point in the direction thereof. The separation procedures which are generally mentioned by *Earle et al.* pertain to a separation of the product and the ionic liquid, or the product and the ionic liquid/acid promoter combination rather than the purification of an ionic liquid from impurities. The combination of references upon which the Examiner relied in this rejection can, therefore, not be deemed to render the subject matter of appellants' Claim 4 *prima facie* obvious within the meaning of Section 103(a), and the Examiner's respective rejection is deemed to be in error.

8) The Examiner's finding that appellants' Claims 11, 18, and 20 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of Earle et al. alone or taken in view of Hackh's Chemical Dictionary and either Kawaki et al. or Thiem et al., and further in view of Wasserscheid et al.²⁴⁾ is, for the following reasons, deemed to be in error.

The Examiner argued in this context:⁸⁰⁾ "*Wasserscheid (...) discloses ... that any volatile compound may be removed from an ionic liquid by distillation. It would have been obvious to evaporate low boiling compounds in Earle (...) alone or further in view of Hackh's Chemical Dictionary ... and either Kawaki (...) or Thiem (...) because Wasserscheid (...) discloses ... that any volatile compound may be removed from an ionic liquid by distillation.*" However, a person of ordinary

79) Cf. final Office action page 7, lines 6 to 14.

80) Cf. final Office action page 9, lines 2 to 9.

skill in the pertinent art following the rationale underlying the Examiner's statement would not have arrived at appellants' purification process.

The nitrotoluene by-products encountered in the process of *Earle et al.* are, as evidenced by the primary reference, volatile compounds which are distilled off at lower temperatures than the product. The Examples of *Earle et al.*, accordingly, already illustrate an application of the disclosure of *Wasserscheid et al.* On the other hand, the product obtained in *Earle et al.*'s process cannot be deemed to constitute an impurity because it cannot reasonably be expected to accumulate in the ionic liquid, and/or to impede the oxidation reaction.

As such, the teaching of *Earle et al.* when taken in view of *Hackh's* Chemical Dictionary and either the disclosure of *Kawaki et al.* or the disclosure of *Thiem et al.*, and the disclosure of *Wasserscheid* is also not deemed to render the subject matter of appellants' Claims 11, 18 and 20 obvious within the meaning of Section 103(a). The Examiner's position that the subject matter of appellants' claims was *prima facie* obvious in light of the teaching of *Earle et al.* when taken in view of the respective secondary references is therefore deemed to be in error.

9) The Examiner's finding that appellants' Claims 18 and 20 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of Earle et al. alone or taken in view of Hackh's Chemical Dictionary and either Kawaki et al. or Thiem et al., and Wasserscheid et al., and further in view of Snyder and Mikes et al.²⁵⁾ is, for the following reasons, deemed to be in error.

The Examiner alleged in this context:⁸¹⁾ "At best, the claims differ from Earle (...) alone or further in view of Hackh's Chemical Dictionary, ...[,] and either Kawaki (...) or Thiem (...), and Wasserscheid (...) in reciting use of a resin," and argued:⁸²⁾ "It would have been obvious that Earle (...) alone or further in view of Hackh's Chemical Dictionary, ...[,] and either Kawaki (...) or Thiem (...), and Wasserscheid (...) uses a resin because Snyder, ...[,] discloses on pages 410-411 that ion exchange was the first of the various liquid chromatography methods to be used widely under modern liquid chromatography conditions and Mikes' ... discloses that synthetic resins are of the greatest importance for ion exchange chromatography."

The Examiner's argument is deemed to clearly lack the rational underpinning in support of the conclusion of obviousness. Appellants' Claim 18 does not specifically refer to a resin, but requires, *inter alia*, that the contaminated ionic liquid be provided by certain steps.

Moreover, as noted in the foregoing, the product obtained in *Earle et al.*'s process cannot

81) Cf. final Office action page 9, lines 18 to 22.

82) Cf. final Office action page 10, lines 6 to 16.

be deemed as an impurity because it cannot reasonably be expected to accumulate in the ionic liquid, and/or to impede the oxidation reaction. The by-products which are formed in the context of the oxidation reaction of *Earle et al.* are removed by distillation and can, as such, also not be deemed to constitute impurities.

The Examiner's position that the combination of references is suited to render appellants' process of Claims 18 and 20 *prima facie* obvious is, therefore deemed to be in error.

10) The Examiner's finding that appellants' Claims 1-3, 8-11, 13, 17, 18, and 20-24 where unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants' alleged admissions on page 10, line 39 through page 11, line 39 of the specification in view of Earle et al.²⁶⁾ is, for the following reasons, deemed to be in error.

The Examiner took the position:⁸³⁾ *"It would have been obvious to chromatographically separate high-boiling impurities from ionic liquids because ... the specification would appear to concede that the separation of high-boiling impurities from ionic liquids by distillation is well known to be difficult and Earle (...) discloses chromatography, an adsorption process, is a known alternative to distillation for separating ionic liquids."*

A person of ordinary skill in the chemical art who considers a separation is not guided by one component without regard to the nature of the mixture which is to be separated. I.e., a reasonable person of ordinary skill would not interpret a statement

the product and isopropanol can be separated by means such as distillation, steam distillation, azeotropic distillation, sublimation, gravity separation, solvent extraction, crystallization, supercritical fluid extraction and chromatography

to mean that any and all product/isopropanol mixtures can be separated by each and every one of the mentioned methods. More specifically and as an example only: if the product were water neither distillation nor steam distillation could be expected to be suitable because isopropanol and water form an azeotrope. If the product were propanol or another alcohol, gravity separation, extraction or crystallization cannot reasonably be expected to be successful, etc.

The referenced sections of *Earle et al.* address the separation of a specific type of product and the ionic liquid, or the separation of the product and the ionic liquid/acid promoter combination. The product of *Earle et al.*'s process is, however, not an impurity. As explained by appellants *inter alia* in the section of the application upon which the Examiner relied:⁸⁴⁾ *"Impurities, in par-*

83) Cf. final Office action page 11, lines 3 to 9.

84) Cf. final Office action page 11, indicated lines 4 and 5.

ticular high-boiling impurities, accumulate in these recycled streams,” and also: “high-boiling components ... frequently impart a color and/or impair the properties of the ionic liquid and/or have other adverse effects.”

Since a person having ordinary skill in the art would not reasonably consider the product of *Earle et al.* as an impurity, such a person would also not reasonably consider the statements of *Earle et al.* concerning the separation of the product and the ionic liquid, or the statements regarding the separation of the product and the ionic liquid/acid promoter combination, to be pertinent with regard to the separation of an ionic liquid and at least one impurity.

The statements of *Earle et al.* can, therefore, not be deemed to suggest or imply any means which can reasonably be expected to be successful in the separation of an ionic liquid an impurity which accumulates in the ionic liquid and which renders the ionic liquid unsuitable for recycling. It should also be appreciated in this context that appellants’ experiments clearly corroborate that the physical and chemical means which are mentioned by *Earle et al.* as suitable for the separation of, e.g., the product and the ionic liquid, are not equally suitable for separating an ionic liquid and an impurity. As shown in the examples described in the application, neither solvent extraction nor distillation are suited to remove the impurities.

The Examiner’s position that the subject matter of appellants’ claims was rendered *prima facie* obvious by appellants’ alleged admissions when taken in view of the teaching of *Earle et al.* is therefore deemed to be in error.

11) The Examiner’s finding that appellants’ Claims 2, 6, 7, 9, 12, 18, and 20–24 where unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants’ alleged admissions in view of Earle et al. and further in view of Snyder²⁷⁾ is, for the following reasons, deemed to be in error.

As concerns, *inter alia*, Claim 18 the Examiner asserted:⁸⁵⁾ “At best, the claims differ from ... [appellants’ alleged admissions] in view of Earle (...) in reciting use of ion exchange chromatography,” and applied the disclosure of *Snyder* for stating that ion exchange was the first of various liquid chromatography methods to be used widely under modern conditions, and for disclosing that reversed phase silica gel packings are the closest to a universal system for modern liquid chromatography and that water is usually used as a base solvent,⁸⁶⁾ arguing that a person of ordinary skill in the art would therefore have been motivated to employ ion exchange, with water as a solvent,

85) Cf. final Office action page 11, lines 15 to 18.

86) Cf. final Office action page 11, lines 18 to 21, and page 14, lines 4 to 13.

and reverse phase silica gel in the separation conducted in the purification of an ionic liquid which is contaminated by at least one impurity.⁸⁷⁾

The Examiner's rejection is deemed to be in error because the Examiner, again, failed to appreciate (1) that appellants' Claim 18 *inter alia* requires that the contaminated ionic liquid be provided by certain steps,⁸⁸⁾ (2) that the product of *Earle et al.* is not an impurity, and (3) that a person of ordinary skill in the pertinent art could therefore not reasonably consider the physical and chemical separation methods which are enumerated by *Earle et al.* for the separation of the product and the ionic liquid, or the separation of the product and the ionic liquid/acid promoter combination, as alternative means which are suitable for removing an impurity from a contaminated ionic liquid. In fact, appellants' investigations corroborate that the respective methods are not equivalents when the removal of impurities from a contaminated ionic liquid is sought. As such, the combination of appellants' alleged concession with the disclosures of *Earle et al.* and of *Snyder*, can also not be deemed to render appellants' process obvious within the meaning of Section 103(a).

The combination upon which the Examiner relied in this rejection can, therefore, not be deemed to render the subject matter of appellants' claims *prima facie obvious* within the meaning of Section 103(a), and the Examiner's respective rejection is deemed to be in error.

12) The Examiner's finding that appellants' Claims 18 and 20 where unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants' alleged admissions in view of Earle et al. and Snyder, and further in view of Mikes et al.²⁸⁾ is, for the following reasons, deemed to be in error.

On the one hand, the Examiner took the position:⁸⁹⁾ *"At best, the claims differ from that which is conceded to old [sic] ... in view of Earle (...) and Snyder,...[,] in the clarity of reciting a resin."* As pointed out in the foregoing, the process of appellants' Claim 18 does not specifically require the utilization of a resin. Claim 18 requires, however, that the contaminated ionic liquid be provided in a certain manner.⁸⁸⁾ The Examiner's conclusion of obviousness is, therefore, deemed to be based on errors in the determination of the scope and content of the prior art, and in ascertaining the differences between the prior art and the claims at issue.

On the other hand, the Examiner argued:⁹⁰⁾ *"It would have been obvious that that which is conceded to old [sic] ... in view of Earle (...) and Snyder ... uses a resin because Mikes' ... discloses*

87) Cf. final Office action page 11, line 21, to page 12, line 5, and page 14, lines 8 to 19.

88) Cf. appellants' remarks in that regard in the context of Issue (6).

89) Cf. final Office action page 12, lines 12 to 16.

90) Cf. final Office action page 12, line 19, to page 13, line 3.

that synthetic resins are of the greatest importance for ion exchange chromatography.” However, as noted in the foregoing, the product of *Earle et al.* is not an impurity, and a person of ordinary skill in the pertinent art cannot reasonably consider the statements of *Earle et al.* regarding the separation of the product and the ionic liquid, or the separation of the product and the ionic liquid/acid promoter combination, as being indicative for means which allow the separation of an impurity and a ionic liquid.

The Examiner’s position that the subject matter of appellants’ claims was *prima facie* obvious in light of appellants’ alleged admissions, the teaching of *Earle et al.* and the disclosures of *Snyder* and *Mikes et al.* is therefore deemed to be in error.

13) The Examiner’s finding that appellants’ Claim 4 was unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants’ alleged admissions in view of Earle et al. and further in view of Gerhold⁹¹⁾ is, for the following reasons, deemed to be in error.

The Examiner asserted:⁹¹⁾ “At best, the claim differs from that which is conceded to old [sic] ... in view of *Earle* (...) in reciting use of a continuous chromatography process,” and applied the disclosure of *Gerhold* for stating that a simulated moving bed is a very successful process for separating components from a feed mixture. The Examiner argued that a person of ordinary skill in the art, therefore, would have been motivated to employ a continuous chromatographic process as required in accordance with appellants’ Claim 4 for the separation of an impurity from an ionic liquid.⁹²⁾

However, as noted above, the particular product obtained in the process of *Earle et al.* is not an impurity, and the mere fact that *Earle et al.* suggest a variety of means for the separation of their particular product and the ionic liquid, or the product and the ionic liquid/acid promoter combination cannot reasonably be deemed to suggest or imply that the respective means are correspondingly and equally suitable in the purification of an ionic liquid from impurities. The lack of predictability in this regard is deemed to be supported by *Gerhold*’s statement:⁹³⁾ “At the outset it is desirable to point out that it is contemplated that the present invention would be efficacious regardless of the separating means employed. The only general limitations are that the flow streams are fluid and that in fact a separation is accomplished by the separating unit in question.” The disclosure of *Gerhold* is not concerned with the treatment of contaminated ionic liquids and, as such, is un-

91) Cf. final Office action page 13, lines 7 to 10.

92) Cf. final Office action page 13, lines 12 to 17.

93) Cf. col. 5, indicated lines 55 to 60, of *US 4,402,832*.

suited to provide information on whether a separation of a contaminated ionic liquid can, in fact, be accomplished by any separating unit.

The Examiner's argument is deemed to lack the rational underpinning which is necessary to support a finding of obviousness under the provisions of Section 103(a) and the Examiner's rejection is, therefore, deemed to be in error.

14) The Examiner's finding that appellants' Claims 11, 18, and 20 were unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants' alleged admissions in view of Earle et al. and further in view of Wasserscheid et al.⁹⁴⁾ is, for the following reasons, deemed to be in error.

The Examiner took the position that:⁹⁴⁾ "*Wasserscheid (...) discloses ... that any volatile compound may be removed from an ionic liquid by distillation. It would have been obvious to evaporate low boiling compounds in that which is conceded to old [sic] ... in view of Earle (...) because Wasserscheid (...) discloses on page 17, lines 13-15 discloses [sic] that any volatile compound may be removed from an ionic liquid by distillation.*"

On the one hand, the nitrotoluene by-products of the process of *Earle et al.* as well as the products are, as evidenced by the primary reference, volatile compounds. The Examples of *Earle et al.*, accordingly, already illustrate an application of the disclosure of *Wasserscheid et al.* On the other hand, as explained in the context of Issue (10), appellants' alleged admission, taken in view of the teaching of *Earle et al.*, cannot reasonably be deemed to establish that appellants' process was *prima facie* obvious within the meaning of Section 103(a).

A person of ordinary skill in the pertinent art following the rationale underlying the Examiner's argument would not have arrived at appellants' purification process. Again, the product obtained in *Earle et al.*'s process is not an impurity because it cannot reasonably be expected to accumulate in the ionic liquid, and/or to impede the oxidation reaction, and a person of ordinary skill in the pertinent art could not reasonably consider the statements of *Earle et al.* regarding the separation of the product and the ionic liquid, or the separation of the product and the ionic liquid/acid promoter combination, as being indicative for means which allow the removal of an impurity from a contaminated ionic liquid.

The Examiner's position that the subject matter of appellants' claims was *prima facie* obvious in light of appellants' alleged admissions, the teaching of *Earle et al.* and the disclosure of *Wasserscheid et al.* is, therefore, deemed to be in error.

94) Cf. final Office action page page 14, line 22

15) The Examiner's finding that appellants' Claims 18 and 20 where unpatentable under 35 U.S.C. §103(a) for being obvious in light of appellants' alleged admissions in view of Earle et al. and Wasserscheid et al., and further in view of Snyder and Mikes et al.³¹⁾ is, for the following reasons, deemed to be in error.

The Examiner asserted:⁹⁵⁾ "At best, the claims differ from that which is conceded to old [sic] ... in view of Earle (...) and Wasserscheid (...) in reciting use of a resin," and argued:⁹⁶⁾ "It would have been obvious that that which is conceded to old [sic] ... in view of Earle (...) and Wasserscheid (...) uses a resin because Snyder ... discloses ... that ion exchange was the first of the various liquid chromatography methods to be used widely under modern liquid chromatography conditions and Mikes' ... discloses that synthetic resins are of the greatest importance for ion exchange chromatography."

However, as noted in the foregoing, the product obtained in *Earle et al.*'s process cannot be deemed as an impurity because it cannot reasonably be expected to accumulate in the ionic liquid, and/or to impede the oxidation reaction. The by-products which are formed in the context of the oxidation reaction of *Earle et al.* are removed by distillation and are therefore volatile compounds as mentioned by *Wasserscheid et al.* rather than impurities. Moreover, as explained, e.g., in the context of Issue (10), a person of ordinary skill in the pertinent art would not reasonably consider the disclosure of means which are suitable to separate the product of *Earle et al.*'s process and an ionic liquid, to suggest or imply that these means are equally suitable to separate impurities and an ionic liquid.

The Examiner's position that appellants' alleged admissions taken in view of the combination of references is suited to render appellants' claims *prima facie* obvious within the meaning of Section 103(a) is, therefore, deemed to be in error.

CONCLUSION

In light of the foregoing reasons and explanations as well as the explanations already presented by appellants in their papers dated January 08, 2007, June 22, 2007, and October 22, 2007,⁹⁷⁾ appellants respectfully urge that the Examiner's rejections were in error. It is therefore respectfully requested that the Examiner's rejections be reversed. Favorable action is solicited.

95) Cf. final Office action page 15, lines 14 to 17.

96) Cf. final Office action page 16, lines 1 to 10.

97) The respective papers are herewith incorporated by reference.

CLAIMS APPENDIX:

1. A process for purifying a mixture of at least one ionic liquid and at least one impurity,
wherein the at least one impurity is a substance having a vapor pressure in the mixture that prohibits complete removal of the substance from the mixture by distillation, and/or
wherein the at least one impurity is a substance that interacts with the at least one ionic liquid so as to prohibit complete removal of the substance from the mixture by distillation,
said process comprising removing the at least one impurity from the mixture by adsorptive separation, and obtaining the resultant at least one ionic liquid.
2. A process as claimed in claim 1, wherein the separation is carried out by means of ion exchange.
3. A process as claimed in claim 1, wherein the separation is carried out by means of chromatography.
4. A process as claimed in claim 3, wherein the separation is carried out by means of a continuous chromatographic process.
6. A process as claimed in claim 1, wherein water, methanol, ethanol, 1-propanol or isopropanol or a mixture thereof is used as solvent.
7. A process as claimed in claim 1, wherein reversed phase silica gels, resins, ion exchangers, zeolites, aluminum oxides or activated carbon are used as stationary phases.
8. An adsorption separation process for removing an impurity from a mixture comprising an ionic liquid and the impurity,
wherein the impurity is a substance having a vapor pressure in the mixture that prohibits complete removal of the substance from the mixture by distillation, and/or
wherein the impurity is a substance that interacts with the ionic liquid so as to prohibit complete removal of the substance from the mixture by distillation,
wherein the ionic liquid has an anion and cation, the cation comprising at least one five- or six-membered heterocycle containing at least one phosphorus or nitrogen atom; and

wherein the process comprises a first step of contacting the contaminated ionic liquid with a resin, and a second step of separating the purified ionic liquid from the resin.

9. The separation process of claim 8, wherein the resin is at least one of an ion exchange resin and an adsorption resin.
10. The separation process of claim 8, wherein the separation is carried out by chromatography.
11. The separation process of claim 8, further comprising a step of removing low boiling compounds by evaporation.
12. The separation process of claim 8, wherein water, methanol, ethanol, 1-propanol, isopropanol or a mixture thereof is used as solvent.
13. The separation process of claim 8, wherein the anion is a halide.
17. A process as claimed in claim 8, wherein the impurity is a substance having a vapor pressure of less than about 10 mbar in the mixture at room temperature.
18. An adsorption separation process for removing at least one impurity from a contaminated ionic liquid,
wherein the at least one impurity is a substance having a vapor pressure in a mixture comprising the at least one impurity and the at least one ionic liquid that prohibits complete removal of the substance from the mixture by distillation, and/or
wherein the at least one impurity is a substance that interacts with the at least one ionic liquid in a mixture comprising the at least one impurity and the at least one ionic liquid so as to prohibit complete removal of the substance from the mixture by distillation,
which process comprises
providing the contaminated ionic liquid by
 - (a) separating volatile components from a mixture comprising the ionic liquid, the volatile components and the at least one impurity, by means of evaporation or rectification, and/or
 - (b) separating non-polar components from a mixture comprising the ionic liquid, the non-polar components and the at least one impurity, by means of extraction with a non-polar organic solvent,

removing the at least one impurity from the contaminated ionic liquid by adsorptive separation, and
obtaining the resultant at least one ionic liquid.

20. A process as claimed in claim 18, wherein the at least one impurity has a vapor pressure of less than about 10 mbar at room temperature in a mixture comprising the at least one impurity and the at least one ionic liquid.
21. A process according to claim 1, wherein the at least one impurity is a polar compound.
22. A process according to claim 1, wherein the at least one impurity is a substance having a vapor pressure of less than about 10 mbar in the mixture at room temperature.
23. A process according to claim 1, wherein the at least one impurity is a substance having a vapor pressure of less than 1 mbar in the mixture at room temperature.
24. A process according to claim 1, wherein the at least one impurity is a polymer that has no measurable vapor pressure in the mixture at room temperature.

EVIDENCE APPENDIX:

N O N E

RELATED PROCEEDINGS APPENDIX:

N O N E